Public debt sustainability and fiscal rules in Central and Eastern Europe

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Introduction

Motivation

- The unsettled discussion about the costs and benefits of fiscal rules: not only from a macroeconomic but also from a social and political point of view
- Controversies surrounding fiscal rules most notable in the EU, where the design of fiscal rules is a product of complex interactions between national and EU-wide interests (see Blanchard, Leandro, & Zettelmeyer, 2021).
- Implications for the post-COVID period, when fiscal rules are re-installed after their suspension during the pandemic, amid high inflation rates, and increased military spending

Aims of the paper

- Assess the role of public debt sustainability in the implementation of national fiscal rules
- Focus: Central and Eastern European (CEE) EU member states
- Find the effects of episodes of the unsustainable increase in public debt (i.e., "fiscal bubbles") on the evolution of the stringency of fiscal rules in CEE countries

Brief literature review and contribution

(1) Work on costs and benefits of fiscal rules (e.g., Iara & Wolff, 2014; Sacchi & Salotti, 2015)

→ We develop a stylised model that encompasses political motives and, using it, we demonstrate how fiscal bubbles can promote tightening of the fiscal framework

(2) Studies on fiscal default episodes (e.g. Reinhart, Reinhart & Rogoff, 2012; Mauro & Zhou, 2021)

→ A relatively novel technique of bubble detection in time series (Phillips, Shi, & Yu, 2015) allows us to date-stamp significant indicators of fiscal crises

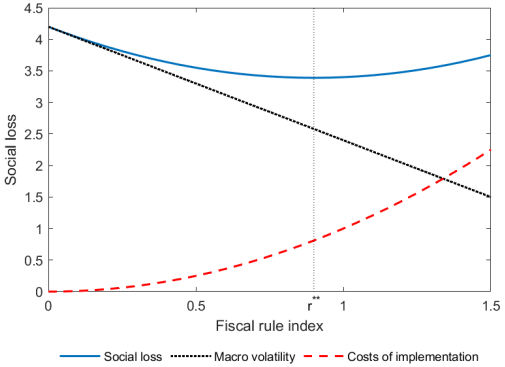
(3) Literature on determinants of fiscal rules (e.g., Badinger & Reuter, 2017, Eklou & Joanis, 2019)

→ By accounting for the factors related to fiscal (un)sustainability that influence changes in fiscal rules in CEEs, we expand the catalogue of potential motives to strengthen fiscal rules

A baseline framework

- A stylised model of fiscal rule adoption that explains why countries select different degrees of fiscal rules stringency and how policy choices can change in the aftermath of a fiscal bubble
- The idea borrowed from Rodrik (2012) who examined the nexus between economic policy and economic growth
- In a nutshell:
  - Fiscal rules contribute to stabilising an economy, i.e., decrease macroeconomic volatility
  - Their adoption entails: (i) implementation and monitoring costs, and (ii) political costs since the government has less room for politically-motivated discretionary actions

Social loss, macro volatility, and cost of fiscal rules implementation



- Macroeconomic volatility

$$\sigma_m(r, g) = \sigma(\underset{-}{g})\,[1 + \theta(1 - r)]$$

where r is a fiscal rule index, g is gov't effectiveness

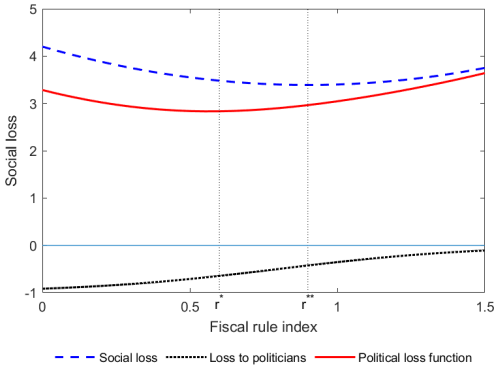
- Social loss function

$$L^S(r, g) = \sigma_m(\underset{-}{r}, \underset{-}{g}) + \phi(\underset{-}{g})\alpha(\underset{+}{r})$$

where $\phi(g)\alpha(r)$ is the overall fiscal rule implementation cost

- The FOC implicitly defines the socially optimal intensity of fiscal rules, r^{**}.

Political dimension

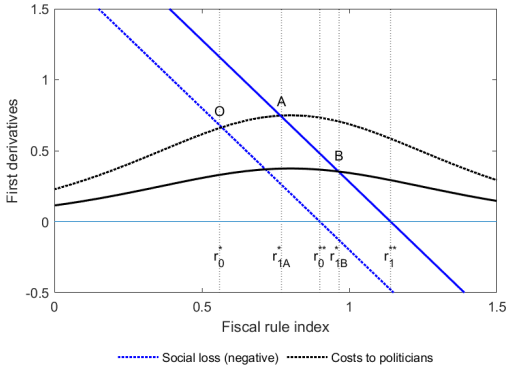


- Politicians pursue goals that go beyond those included in the social loss function (e.g. building support for the upcoming elections). The payoff to politicians, $\tilde{\pi}(\underset{-}{r})$, is maximal when there are no fiscal rules.
- The loss to politicians is $\pi(\underset{+}{r}) \equiv -\tilde{\pi}(\underset{-}{r}) < 0$
- Political loss function is not the same as a social loss function

$$L(r, g) = \lambda L^S(r, g) + \pi(r)$$

- The FOC implicitly defines the socially suboptimal intensity of fiscal rules, $0 < r^* < r^{**}$.

Fiscal rule stringency and bubbles



- The **perception channel** works via the changes in the perceived gain of having the fiscal rule (θ goes up):
  - bubble $\rightarrow$ the perceived gain goes up $\rightarrow$ an increase in the fiscal rule stringency
  - Figure: O $\rightarrow$ A
- The **social pressure channel** works via the "honesty" of the government (λ goes up):
  - bubble $\rightarrow$ a rise in social pressure to get fiscal policy right $\rightarrow$ an increase in the fiscal rule stringency
  - Figure: A $\rightarrow$ B

Fiscal rule stringency, bubbles, and government effectiveness

- Using the FOC we demonstrate that the overall effect of a bubble on fiscal rule stringency depends on government effectiveness

$$\frac{\partial \Delta r}{\partial g} = \frac{\Delta \theta}{\Omega(g)} \left[\sigma'(g) - \phi'(g) c_{\alpha'} \frac{\Delta r}{\Delta \theta} \right]$$

where $\Delta x = x_B - x_0$ for any x, 0 is a state without a bubble and B is a state with a bubble, $\Omega(g) = \phi(g) c_{\alpha'} + c_{\pi'}$, and both c's are (approx.) constant, $c_{\alpha'} = \frac{\Delta \alpha'}{\Delta r}$, $c_{\pi'} = \frac{1}{\lambda_B} \frac{\Delta \pi'}{\Delta r}$.

- **Substitutability**: the higher the term $\sigma'(g)$ (in absolute terms), the stronger the mitigating impact of gov't effectiveness on macroeconomic volatility and the need for fiscal rules is limited
- **Complementarity**: the higher the term $\phi'(g)$ (in absolute terms), the easier to control are the costs of strengthening fiscal rules (a rise in gov't effectiveness provides more room for fiscal rules)
- The **relative importance of the perception channel** in tightening fiscal rules in response to a fiscal bubble: the smaller the ratio $\frac{\Delta r}{\Delta \theta}$, the more important the channel

▸ FOC details

Theoretical framework: a recap

We demonstrate that:

- Politicians select a suboptimal level of fiscal rule stringency
- Fiscal bubbles are conducive to the tightening of the fiscal framework and work via perception and social pressure channels
- Government effectiveness attenuates the sensitivity of fiscal rule stringency to fiscal bubbles when substitutability between government effectiveness and fiscal rules is strong, complementarity is weak, and the relative importance of the perception channel is high

Detection of fiscal bubbles: sequential right-tail ADF tests

The first stage of the empirical analysis

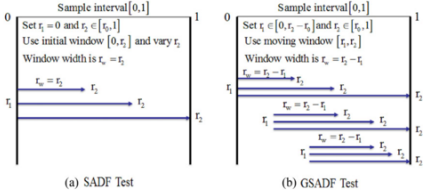
- Phillips, Wu & Yu (2011) and Phillips, Shi & Yu (2015) propose two methods for nearly real-time bubble detection:
  - Phillips et al. (2011) is a sup statistic based on the forward recursive regression

$$SADF(r_0) = \sup_{r_2 \in [r_0, 1]} ADF_0^{r_2}$$

  - GSADF statistic is the largest ADF statistic in a double recursion over all feasible ranges of r_1 and r_2

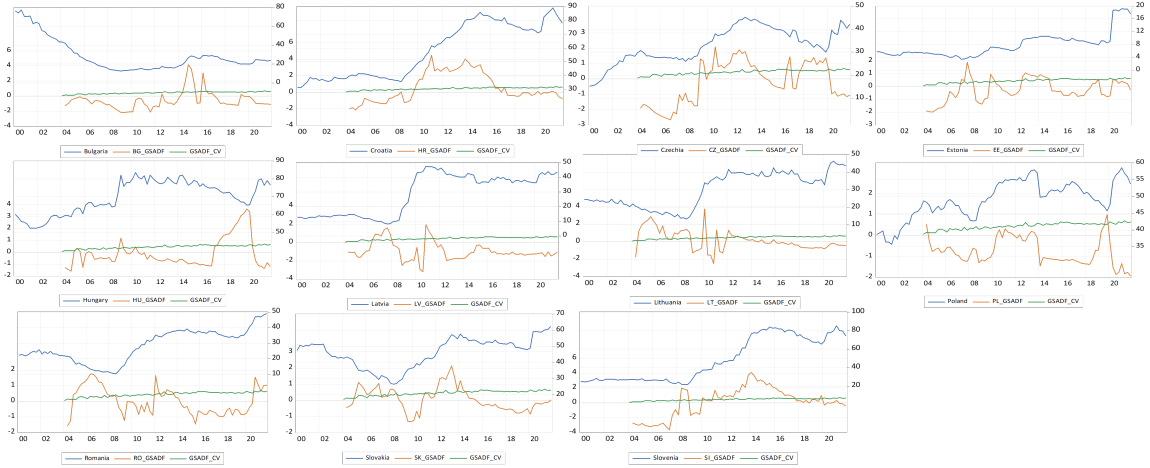
$$GSADF(r_0) = \sup_{\substack{r_2 \in [r_0, 1] \\ r_1 \in [0, r_2 - r_0]}} ADF_{r_1}^{r_2}$$

- We rely on GSADF given its generality and ability to detect multiple bubbles in debt-to-GDP series.



Source: Phillips, Shi & Yu (2015, p. 1049).

Detection of fiscal bubbles: GSADF sequences



Notes: Blue lines – debt-to-GDP ratios (RHS), orange – sequences of GSADF statistics (LHS), green – simulated 95% critical values (LHS).

Detection of fiscal bubbles: Test results

Country	t-stat (GSADF)	p-value	Observations	Bubble starts
Bulgaria	4.171	0.000	88	2014Q3
Croatia	4.480	0.000	88	2009Q4
Czechia	2.103	0.039	88	2009Q2
Estonia	1.901	0.057	88	2009Q4, 2012Q3
Hungary	3.650	0.000	88	2009Q1
Latvia	1.978	0.052	88	2010Q4
Lithuania	3.715	0.000	88	2010Q1
Poland	0.996	0.336	88	2004Q2
Romania	1.746	0.077	88	2012Q1, 2020Q4
Slovakia	2.139	0.035	88	2011Q1
Slovenia	4.087	0.000	88	2010Q1

- We detect at least one bubble in each country, two bubbles in two countries (EE, RO)
- We only consider fiscal bubbles when GSADF exceeds the 95% (sequence) critical value and when the debt-to-GDP ratio increases
- In line with Esteve & Prats (2023a) we consider "bubbles" when the debt ratio falls to be fiscal adjustment episodes (ignored here)

Variables used in panel-data modelling

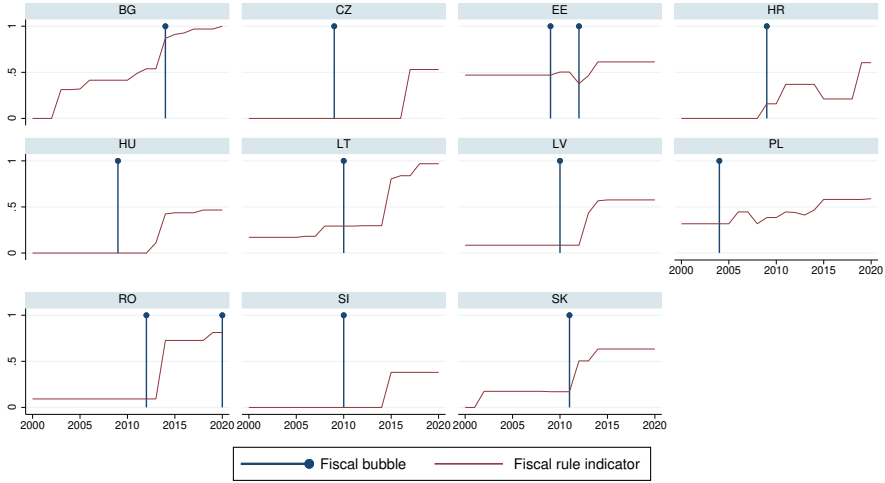
The second stage of the empirical analysis

→ Aims at capturing the effect of public debt unsustainability episodes (i.e., fiscal bubbles) on the degree of fiscal rules stringency in CEE economies

Mnemonic	Description	Raw data source
FR	Fiscal Rule Index based on a set of the legal implementation, monitoring, and correction criteria; normalized to the range of 0 to 1	European Commission
FB	Fiscal bubble indicator; takes the value of 1 on the year in which the fiscal bubble episode begins, and 0 otherwise	Own estimation
D_DEBT	Annual change in the general government consolidated gross debt to GDP [percent]	Eurostat
CAPB	Cyclically adjusted net lending or net borrowing of the general government to GDP [percent]	Ameco
D_INT_DEBT	Annual change in the interest payable on the general government debt relative to GDP [percent]	Eurostat
OUTPUT_GAP	The gap between actual GDP and trend GDP, relative to trend GDP [pp]	Ameco
GOVT_EFF	The Worldwide Governance Indicators: government effectiveness [index]	World Bank
EMU	Indicator variable; takes the value of 1 when a country is the EMU member, and 0 otherwise	Own elaboration

▸ Descriptive statistics

Identified fiscal bubbles episodes and fiscal rule stringency indicator



Panel unit-root tests

Empirical models

- The panel regression specification in the linear form:

$$FR_{it} = \mu_i + \eta_t + \alpha t \times \mu_i + \beta FB_{i,t-2} + \gamma' Z_{i,t-2} + \varepsilon_{it}$$

- 2-way fixed effects and country-specific trends as the main specification
- Following the Badinger & Reuter (2017) study on fiscal rule determinants, all independent variables, with the exception of the EMU membership, are lagged by two years: (a) political process of fiscal rules implementation, (b) endogeneity of fiscal rule stringency
- Baseline estimator: fractional probit (Papke & Wooldridge, 1996), with the outcome variable ranging from 0 to 1
- Additionally: generalized estimating equation (GEE) with population averaged effects (Papke and Wooldridge, 2008)

Baseline results: direct effects of fiscal bubble occurrence

Dep. var: *FR*	(1) 2-way FE	(2) 2-way FE	(3) 2-way FE	(4) 2-way FE + trends	(5) 2-way FE + trends	(6) 2-way FE + trends	(7) GEE pop av-eraged	(8) GEE pop av-eraged	(9) GEE pop av-eraged
FB	0.250*	0.299**	0.295**	0.207*	0.243*	0.228*	0.199*	0.224*	0.247**
	(0.128)	(0.129)	(0.121)	(0.119)	(0.132)	(0.125)	(0.120)	(0.130)	(0.117)
D_DEBT		0.0167	0.0164		-0.0002	0.0018		0.0105	0.0102
		(0.0171)	(0.0170)		(0.0140)	(0.0161)		(0.0173)	(0.0159)
CAPB		0.0423	0.0428		0.00190	0.00872		0.00634	0.00601
		(0.0342)	(0.0349)		(0.0242)	(0.0280)		(0.0166)	(0.0145)
D_INT_DEBT		-0.0276	-0.0355		-0.0325	-0.0712		-0.0811	-0.0560
		(0.0991)	(0.101)		(0.127)	(0.146)		(0.113)	(0.106)
OUTPUT_GAP		0.0375	0.0378		0.0121	0.0183		0.0275*	0.0295**
		(0.0263)	(0.0268)		(0.0234)	(0.0261)		(0.0162)	(0.0145)
GOVT_EFF		0.131			0.567*			-0.310	
		(0.389)			(0.344)			(0.379)	
EMU		-0.232	-0.217		0.279	0.256		-0.0117	-0.0167
		(0.363)	(0.353)		(0.261)	(0.273)		(0.263)	(0.211)

Notes: The table shows the results of fractional panel probit estimation; dependent variable is the standardized fiscal rule index; see Eq. (1); two-way fixed effects (1-3), two-way fixed effects and country-specific trends (4-6), generalized estimating equation with population averaged effects (7-9); robust standard errors clustered at the country level in parentheses; * and ** denote statistical significance at the 0.1 and 0.05 level, respectively.

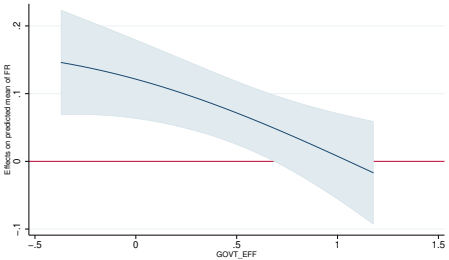
Extension: the role of the overall government effectiveness (1)

- The effect of fiscal bubbles on fiscal rules stringency conditional on the remaining control variables included in panel modelling

Dep. var: *FR*	(1) *D_DEBT*	(2) *CAPB*	(3) *D_INT_DEBT*	(4) *OUTPUT_GAP*	(5) *GOVT_EFF*	(6) *EMU*
FB	0.273*	0.172	0.245**	0.466***	0.543***	0.318*
	(0.142)	(0.140)	(0.107)	(0.177)	(0.177)	(0.187)
mod	0.000200	0.00270	-0.0319	0.00141	0.604*	0.320
	(0.0133)	(0.0251)	(0.135)	(0.0224)	(0.342)	(0.270)
FB × *mod*	-0.00625	-0.0568	-0.0122	0.0557	-0.515**	-0.205
	(0.0311)	(0.0600)	(0.329)	(0.0346)	(0.225)	(0.248)

Notes: The table shows the results of fractional probit panel models augmented with interaction effects between the fiscal bubble variable (FB) and each of the additional predictors (mod); an interacted predictor is indicated in a column title; the whole set of variables (see Table 2, column 5) is included in each specification only the main and interaction effects are reported for each specification of interest. ***, **, and * denote statistical significance at 0.01, 0.05, and 0.1 levels, respectively.

Extension: the role of the overall government effectiveness (2)



Notes: The figure shows average marginal effects of the government effectiveness variables (*GOVT_EFF*) on the fiscal rule index (*FR*); see Table 3, column 5; bands represent 90-percent confidence intervals around the baseline estimates.

- The marginal effects of fiscal bubbles on the stringency of fiscal rules
- The effect is positive (at the 0.1 significance level) up to the *GOVT_EFF* of around 0.7 and insignificant for higher values of this indicator

Conclusions

- We model how the costs and benefits of fiscal rules explain why politicians select different levels of fiscal stringency and, more importantly, how fiscal bubbles bolster politicians' willingness to tighten fiscal rules via the perception and social pressure channels
- Employing a bubble detection algorithm based on recursive unit-root testing, we identify the episodes when public debt reveals explosive ("bubble-like") behaviour between 2000 and 2021 in 11 CEE countries
- Using the panel fractional logit regression of fiscal rules determinants, we find that:
  (a) The occurrence of fiscal bubbles increases the propensity of a government to increase the stringency of the fiscal rules
  (b) CEE economies use a tightening of fiscal rules as a means for fiscal adjustment required when risks of public debt unsustainability become excessive
  (c) Beneficial effects of fiscal bubbles are decreasing in government effectiveness, which signals that the perception channel is likely to dominate the social pressure channel

Some model details

- The FOC is
$$\phi(g)\alpha'(r_s) - \sigma(g)\theta_s + \lambda_s^{-1}\pi'(r_s) = 0$$
where $s = \{0, B\}$ is a state: 0 means no bubble, and B is a bubble
- Using the FOC we demonstrate that the overall effect of a bubble on fiscal rule stringency is
$$\Omega(g)\Delta r = \sigma(g)\Delta\theta + \frac{\Delta\lambda}{\lambda_0\lambda_B}\pi'(r_0)$$
where $\Delta x = x_B - x_0$ for any x, $\Omega(g) = \phi(g)c_{\alpha'} + c_{\pi'}$, and both c's are (approximately) constant, $c_{\alpha'} = \frac{\Delta\alpha'}{\Delta r}$, $c_{\pi'} = \frac{1}{\lambda_B}\frac{\Delta\pi'}{\Delta r}$.
- The overall effect of a bubble on fiscal rule stringency depends on government effectiveness
$$\frac{\partial\Delta r}{\partial g} = \frac{\Delta\theta}{\Omega(g)}\left[\sigma'(g) - \phi'(g)c_{\alpha'}\frac{\Delta r}{\Delta\theta}\right]$$
It is not possible to determine the sign of this derivative a priori.

Go back

Descriptive statistics of variables used in panel models

Variable	N	Mean	Median	Min	Max	SD	IQR	Skewness	Kurtosis
FR	231	.307	0.296	0	1	.275	.503	.566	2.396
FB	231	.056	0.000	0	1	.231	0	3.851	15.829
D_DEBT	231	.977	-0.100	-13.5	18.5	4.689	4.6	1.005	4.759
CAPB	230	-1.14	-0.900	-8.6	6.1	2.47	3.3	-.244	3.314
D_INT_DEBT	230	-.073	-0.100	-2	1.2	.322	.3	-1.137	10.972
OUTPUT_GAP	230	-.037	-0.100	-11.2	11.4	3.628	4.3	-.089	4.168
GOVT_EFF	231	.611	0.678	-.372	1.335	.395	.467	-.75	2.755
EMU	231	.212	0.000	0	1	.41	0	1.408	2.984

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Panel unit-root tests for variables included in panel-data models

Variable	Levin-Lin-Chu		Breitung		Im-Pesaran-Shin	
	const	const + trend	const	const + trend	const	const + trend
FR	0.114	-2.645***	1.690	-1.571*	3.491	-2.115**
FB	-5.640***	-4.110***	-10.066***	-7.457***	-7.438***	-7.528***
D_DEBT	-2.626***	-2.538***	-4.702***	-3.148***	-2.958***	-3.542***
CAPB	-2.431***	-2.787***	-3.190***	-1.871**	-1.477*	-2.836***
D_INT_DEBT	-7.831***	-3.541***	-5.822***	-4.274***	-4.406***	-4.832***
OUTPUT_GAP	-4.333***	-3.010***	-3.635***	-1.548*	-1.240	-1.331*
GOVT_EFF	-3.194***	-2.200**	0.435	-2.105**	-1.870***	-3.457***

Notes: The table reports the following statistics LLC adjusted t, Breitung lambda statistic, Im-Pesaran-Shin Z statistics; the null hypothesis: panels contain unit roots; the tests are run with both a constant and a constant and a deterministic trend; variables missing a single observation (see Table 1) are tested in a balanced panel spanning from 2001 to 2021; ***, **, and * denote statistical significance at 0.01, 0.05, and 0.1 levels, respectively.

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